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On the Temporo-Maxillary Articulation. By J. Smith, M.D.,
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The following notes on certain points of interest connected with the Temporo-Maxillary Articulation, must be regarded as the result of a few observations and inquiries made in a subject as yet by no means fully wrought out. The characters of the temporo-maxillary articulation present many anomalies and complications, rendering its investigation one of much difficulty, and any theories in reference to it, subject to great latitude of opinion. The remarks advanced in the present paper are therefore to be considered as suggestive, rather than conclusive in their nature, and as admitting and probably requiring, much further research and many modifications.

Considerable difficulties present themselves in attempting to demonstrate the peculiarities of external character in the condyles of the lower jaw, especially in the human subject. Because the multiplicity of movements performed by, although perhaps not strictly essential to the joint,—and the numerous

different accidental and other conditions of relative parts, such as the teeth, &c., from infancy to old age,—lead to many modifications in the mode of using the jaw, and, consequently, to great dissimilarity of form in the condyles, not only of different individuals, but of the same individual at different times. Through all these varieties, however, there will, upon careful examination, be found to be certain general principles distinctly traceable.

Before proceeding further it may be as well to premise that the description necessary here to be given may appear too artificial; but to be intelligible this is required. Allowance must accordingly be made for using terms, the intention of which is rather to *illustrate* than *describe* the structures under notice.

On looking at the condyles of the lower jaw, we find them set with their long or transverse axes, *not at right angles* to the plane of motion as an ordinary hinge would be, but set *obliquely* to it. That is to say, instead of being both at right angles to a line drawn from the centre of the chin, directly backwards to a point midway between the articulations, each condyle is rather placed at right angles to a line drawn in the horizontal direction of that ramus to which it respectively belongs. Owing to this construction, then, the condyles cannot, in the movement of merely opening and shutting the mouth, act as a simple hinge; as such a hinge would, correctly, be at right angles to the plane of motion.

Instead, therefore, of each condyle constituting a part of the common axis upon which this motion of the jaw is made, each appears rather to constitute an articular surface winding spirally round that axis. Here the error of confounding the *whole condyle* with that limited portion of it forming its *true articular surface* must be guarded against. This *articular surface* passes over the condyle, from its *anterior* aspect at the external end, to its *posterior* aspect at the internal end.

This proposition may, perhaps, be best and most easily illustrated by the analogy afforded by some of the lower animals. In the Carnaria—such as the lion, tiger, leopard—a construction of this kind is very evident; but in man also, the same character prevails, and in a well-developed condyle is distinctly marked.

The articulating surface of the condyle thus acquires some of the properties of a screw: that screw being a conical screw, or helix, and having its axis lying at right angles to the plane of vertical motion in the jaw, or some way nearly so; and being from the direction of the thread (that is the articular surface), a right-hand screw on the left side, and a left-hand screw on the right side; the base of the cone being placed externally.

In using the word screw here, it is not of course meant that either a perfect screw, as defined in mechanics, exists, or that the power of one is imparted to the joint. In fact, only a limited portion of such a conical screw is presented in the condyle,—half, or a third of a turn of the thread being all that is necessary for the purposes of the joint, the remaining portion being unnecessary, and consequently absent. This absence of that complementary portion indeed, leading to some difficulty in recognising that which is present.

The *Glenoid cavity* will, in all such examples, be found to correspond to the characters of the condyle, constituting as it were a longitudinal section of a spiral chamber: the condyle and glenoid cavity together thus constituting a certain portion of a *conical tap*, moving in a corresponding portion of a *conical die*.

Regarding the *action* of the joint, viewed as thus constructed, it will be seen that as the respective surfaces of a *conical tap* and *die* are never wholly in contact unless the screw is completely home, so in many stages of motion in this joint, the condyloid and glenoid surfaces must be to some extent separate from each other. And on attentively observing the action of the condyle within the glenoid cavity, this will be found to be the case; as in opening the jaws the point of contact between the surface of the condyle and glenoid cavity recedes, inwards and backwards, describing a spiral track over the condyle, corresponding to the articular surface, and passing from the *anterior* external until it only exists at the *posterior* internal aspect of the articulation; and returning again until the whole is in contact, as the mouth is closed. By this means a great amount of friction is avoided; what would otherwise be a

rubbing, being thus converted into a *rolling* motion, between the condyloid and glenoid surfaces; while greater steadiness and security is afforded to the jaw during these movements, by one or other condyle being always within the glenoid cavity.

So far this spiral character modifies the action of the joint during this simultaneous motion of both articulations, both acting alike. But it will be seen that the action of two *reverse* screws, as these are—thus taking place *at once*, would, under the circumstances in which they are placed, prevent the *complete* or *perfect* action of either; and it seems that this peculiar construction is therefore most perfectly exercised only during what may be considered as the essential action of the jaw—namely, that of *mastication*.

During mastication in man, the condyle of one side remains within the glenoid cavity; the jaw is projected towards this side—while the condyle on the other side emerges from the glenoid cavity, and glides forward upon the zygoma. The substances to be masticated are crushed between the teeth of *that side on which the condyle remains in situ*; and this condyle, during the closure of the teeth, by the construction of joint which has been indicated, screws, if we may so speak, home in its spiral chamber, and so brings back the jaw to its natural position.

It only remains to say a word regarding the interarticular cartilage found in this joint. The condyle, *while covered by this structure*, fits accurately the hollow of the glenoid cavity. In the dry condition of the bones this adaptation is not so complete, being barely sufficient in some instances for illustrating the subject of the present remarks. But along with thus filling up spaces, which would otherwise be left vacant, between the articulating surfaces—another, and perhaps the chief purpose fulfilled by the interarticular cartilage, is that of affording a means of greater security for that condyle which during mastication leaves the glenoid cavity—the double concave cartilage following its movement, and thus serving as a sort of portable socket for the condyle when acting, as it were, beyond the articulation—a movement which, by its anomalous character, may account for some modifications found in this when compared with other joints.

